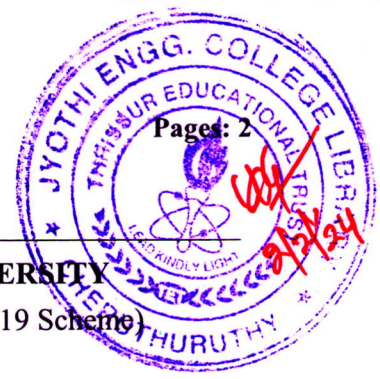


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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

B.Tech Degree S6 (S, FE) Examination January 2024 (2019 Scheme)

**Course Code: ECT352**

**Course Name: DIGITAL IMAGE PROCESSING**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

Marks

- 1 Explain HIS colour model with cylindrical representation. (3)
- 2 Define the term 'Mach band effect' in image processing. (3)
- 3 Determine whether the matrix  $(1/\sqrt{2}) \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$  is unitary or not. (3)
- 4 Give the applications of Singular Value Decomposition (SVD) in image processing. (3)
- 5 Explain the limitations of averaging filter. (3)
- 6 Give the transfer function of non-separable and separable low pass filter for image enhancement. (3)
- 7 Outline the causes of image degradation. (3)
- 8 List the drawbacks of inverse filtering. (3)
- 9 Give the examples of Hierarchical and Partitional Clustering. (3)
- 10 List any three applications of Image Segmentation techniques. (3)

**PART B**

*Answer one full question from each module, each carries 14 marks.*

**Module I**

- 11 a) Explain RGB and CMY colour model. Give the limitations of RGB model. (8)
- b) Using image transformation model, describe the elements of visual perception. (6)

**OR**

- 12 a) Explain the working principle of image sensors used in Digital Camera (8)
- b) Classify and explain different types of Images. (6)

**Module II**

- 13 a) Explain the Predictive coding technique with Delta modulation system. (6)
- b) Compute the inverse 2D DFT of the transform coefficients given by (8)

$$F[k, l] = \begin{bmatrix} 16 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

OR

- 14 a) Illustrate the algorithmic steps to generate Haar basis. (8)  
 b) Describe the block diagram of Transform based image coding scheme. (6)

## Module III

- 15 a) Give the transfer function of two-dimensional Butterworth high pass filter for image enhancement. (4)

- b) (10)

Perform the Histogram equalization of the image

$$\begin{bmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{bmatrix}$$

OR

- 16 a) A 3 x 3 mean filter in frequency domain is given by  $(1/9) \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ . Prove that it behaves like a low-pass filter. (10)

- b) Compare spatial domain filtering and frequency domain filtering of images. (4)

## Module IV

- 17 a) Differentiate between constrained and un-constrained image restoration techniques. (4)  
 b) Describe restoration of image using Lagrange multiplier. (7)  
 c) List the properties of median filter. (3)

OR

- 18 a) Describe image degradation model using Weiner filter. (6)  
 b) Differentiate between linear and non-linear image restoration. (3)  
 c) Give the purpose of Geometric Transformations. Explain the transformations- Translation, Scaling and Rotation. (5)

## Module V

- 19 a) Compare Canny edge detector and Laplacian of Gaussian edge detector. (6)  
 b) Summarize the steps involved in Greedy Snake Algorithm. What are two main drawbacks of snake formation. (8)

OR

- 20 a) Discuss the application of thresholding for image segmentation. (6)  
 b) Describe edge detection using first order derivatives. (8)

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